REMARKS

Pending claims 1 to 23 currently stand rejected under 35 U.S.C. §103(a) as being unpatentable over Doerr (U.S. 6,304,380), alone or in view of Xie et al (U.S. Patent No. 6,212,008). Pending claims 24 to 27 currently stand rejected under 35 U.S.C. §103(a) as being unpatentable over Xie et al in view of Fukushima (U.S. Patent No. 6,507,422).

Applicant wishes to point out several fundamental differences between the device disclosed in Doerr et al and the device according to the present invention. First and foremost, the Doerr et al device has four ports and is totally reciprocal, i.e. has no isolating function. All of the light entering port 400-2 will exit port 400-1, and all light entering port 400-1 will exit port 400-2. The present invention is a three port **isolating** beam combiner/beam separator, which can be operated in two different ways: first as a combiner for combining first and second sub-beams entering the second and third ports for outputting the first port, while preventing light entering the first port from exiting the second and third ports; and second as a separator for separating an input beam of light from the first port into orthogonally polarized first and second sub-beams for output the second and third ports, respectively, while preventing light entering the second and third ports from exiting the first port. The key to this feature is the "non-reciprocal rotator",

e.g. a Faraday rotator and a half-wave plate, which rotates the polarization of the light passing in one direction, while having no cumulative effect on the polarization of the light passing the opposite direction. With this arrangement, the induced polarization rotations from the Faraday rotator and the half wave plate either cancels each other out or is cumulative, depending on which direction the light travels. Moreover the Faraday rotator can be controlled to change the direction from which polarization rotation is cumulative, i.e. whether the device is a splitter or a combiner.

The Faraday rotator (45 DEG) disclosed in Doerr rotates the polarization of the light passing in either direction by the same amount, just in the opposite direction. Accordingly, the Faraday rotator (45 DEG) disclosed in Doerr does not rotate a polarization of each of the two orthogonal beams of light, while maintaining the **orthogonal** relationship therebetween, when passing therethrough in one direction, while having no cumulative effect on the polarization in an opposite direction. In fact, the Faraday rotator (45 DEG) disclosed in Doerr rotates the polarization of both sub-beams, which have the **same** polarization, when traveling in either direction, making the polarization of both of the sub-beams go from 45° to p-polarized in one direction and o-polarized to 45° in the opposite direction. The Faraday rotator in the Doerr et al reference must be kept in the same

position to ensure the light travels along the correct axis in the PM fiber, whereby altering the Faraday rotator (45 DEG) would make the device completely malfunction.

To expedite prosecution, the claims of the application have been amended to overcome the objections of the Examiner and to better define the invention in light of the cited prior art. In particular, claim 1 has been amended, by replacement of the term "or" with "and", to clarify that the device of the present invention is operable as both an isolating splitter and an isolating combiner depending on which way the non-reciprocal rotator is operated. Accordingly, when used as a splitter the first port inputs a beam, which is split into two sub-beams that are output the second and third ports, respectively, while light is prevented from entering the first port from the second and third ports. Moreover, when used as a combiner the first port receives the combined inputs of the second and third ports, while light is prevented from traveling to the second and third ports from the first port.

This feature is clearly contrary to the teachings of Doerr et al, which discloses a device that ensures the polarizations of the sub-beams are the same when passing through the BF2 and the 45 DEG, and that recombines the two sub-beams of light for output a different output port 400-1, separate from the first port 400-2.

There are several other discrepancies between the device disclosed in the Doerr et al reference and the device of the present invention, namely: the first port 400-2 is not used for outputting a combined beam of light, the combined beam of light is output the fourth port 400-1. Second, the second and third ports do not receive and launch **orthogonally** polarized sub-beams, as in the present invention. It is an essential aspect of the Doerr et al device that both of the sub-beams have the same polarization entering the second and third ports, while it is an essential feature of the present invention that the sub-beams have orthogonal polarizations. Accordingly, Doerr et al do not teach or even infer the present invention, and it would be totally inappropriate to suggest that a simple rearrangement of the elements of the Doerr et al device would lead to the present invention.

The non-reciprocal polarization rotator of the Doerr et al and the Xie et al devices comprise a single Faraday rotator, which rotates the polarization of light a given amount, but by a different direction depending on which direction the light passes, whereby the non-reciprocal rotator of the present invention rotates the polarization of light by a given amount, e.g. 90°, in one direction, and has no cumulative effect on the polarization of the light traveling in the opposite direction.

Such an element is not disclosed or even inferred in the Doerr et al or the Xie et al references.

Claims 24 to 27 have been canceled.

Claims 28 to 31 have been added to ensure all aspects of the invention are protected. Claim 28 defines an isolating beam splitter, which outputs orthogonally polarized sub-beams, and includes a non-reciprocal polarization rotator, which rotates the polarization of the sub-beams traveling in one direction by 90°, while having no cumulative effect on the polarization in the opposite direction. Neither of these features is taught or even inferred by the cited prior art, and are therefore novel and unobvious. Claims 29 and 30 claim specific embodiments of the beam splitter that include particularly advantageous features, e.g. equal optical path lengths.

Claim 30 defines an isolating beam combiner, which inputs orthogonally polarized sub-beams, and includes a non-reciprocal polarization rotator, which rotates the polarization of the sub-beams traveling in one direction by 90°, while having no cumulative effect on the polarization in the opposite direction. Neither of these features is taught or even inferred by the cited prior art, and are therefore novel and unobvious.

If, however, any issues remain, the Examiner is invited to call Applicant's undersigned counsel so that a brief interview can be arranged to resolve these issues.

It is believed no fee is due at this time. If that determination should be incorrect, then please debit Deposit Account No. 50-0644 and notify the undersigned.

Respectfully submitted,

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I hereby certify that the correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on 8-25-2005

8/26/05
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